



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/646,103      | 08/22/2003  | Harry Liu            | MICRON.214DDV1      | 8412             |

20995 7590 04/19/2005

KNOBBE MARTENS OLSON & BEAR LLP  
2040 MAIN STREET  
FOURTEENTH FLOOR  
IRVINE, CA 92614

|          |
|----------|
| EXAMINER |
|----------|

PIZARRO CRESPO, MARCOS D

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

2814

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H: A

# Office Action Summary

Application No.

10/646,103

Applicant(s)

LIU ET AL.

Examiner

Marcos D. Pizarro-Crespo

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

Application/Control Number: 10/646,103 (Final Rejection)  
Art Unit: 2814

Page 2

Attorney's Docket Number: MICRON.214DDV1

Filing Date: 8/22/2003

Claimed Priority Dates: 1/24/2002 (Divisional 10/057,162)  
8/14/2000 (Divisional 09/638,419)

Applicant(s): Liu, et al.

Examiner: Marcos D. Pizarro-Crespo

### **DETAILED ACTION**

This Office action responds to the amendment filed 3/15/2005.

#### ***Acknowledgment***

1. The amendment filed on 3/15/2005, responding to the Office action mailed on 12/15/2004, has been entered. The present Office action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office action are claims 1-20.

#### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 4, 8, 9, 12-14, 16, 17, 19, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Tehrani (US 5861328).

4. Regarding claim 1, Tehrani shows (see, e.g., figs. 4-8) all aspects of the instant invention including a process for passivating a magneto-resistive bit **41** having a top

Art Unit: 2814

surface and side walls characterized by encapsulating the top and side wall surfaces of the bit **41** with a conductive etch stop barrier layer.

5. Regarding claim 2, Tehrani shows the conductive barrier layer comprising CrSi (see, e.g., col.6/ll.1).

6. Regarding claim 4, Tehrani shows the method further comprising forming a diffusion barrier between the conductive barrier layer and the top surface and sidewalls of the bit (see, e.g., col.6/ll.2).

7. Regarding claim 8, Tehrani shows (see, e.g., figs. 4-8) all aspects of the instant invention including a process for passivating a magneto-resistive bit structure characterized by the steps of:

- ✓ Providing a GMR stack **35** upon a substrate
- ✓ Selectively patterning the GMR stack **35** to form one GMR bit **41** having a top surface and side walls
- ✓ Providing an conductive etch-stop barrier layer that encapsulates the patterned GMR stack **35** including the top surface and sidewalls of the bit (see, e.g., fig. 5)
- ✓ Selectively patterning the etch-stop layer so that edges of the layer extend out past the edges of the GMR bit **41** (see, e.g., fig. 6)

8. Regarding claim 9, Tehrani shows the process further comprising forming a diffusion barrier between the etch-stop layer and the patterned GMR stack (see, e.g., col.6/ll.2).

Art Unit: 2814

9. Regarding claim 12, Tehrani (see, e.g., figs. 4-8) shows a process for passivating a patterned magneto-resistive bit structure in a magneto-resistive memory, the process comprising:

- ✓ Providing a substrate with the patterned magneto-resistive bit structure **41**, the bit **41** having a top surface and side walls
- ✓ Forming a conductive etch-stop barrier layer over the substrate, the etch-stop layer covering the top surface and side walls of the bit structure (see, e.g., fig. 5)
- ✓ Patterning the etch-stop layer such that it is removed from portions of the substrate but it remains on the top surface and around the side walls of the bit structure (see, e.g., fig. 6)

10. Regarding claim 13, Tehrani shows the substrate further comprising a monolithic integrated circuit (see, e.g., col.2/ll.28-40).

11. Regarding claim 14, Tehrani shows the etch-stop layer comprising CrSi (see, e.g., col.6/ll.1).

12. Regarding claim 16, Tehrani shows the process further comprising forming a diffusion barrier before forming the etch-stop layer such that the diffusion barrier is formed between the etch-stop layer and the substrate (see, e.g., col.6/ll.2). Tehrani further shows that patterning the etch-stop layer further comprises patterning the diffusion barrier (see, e.g., fig. 6).

13. Regarding claim 17, Tehrani shows the diffusion barrier comprises Ta (see, e.g., col.6/ll.2).

14. Regarding claim 19, Tehrani shows the diffusion barrier comprises TaN (see, e.g., col.6/ll.2).

15. Regarding claim 20, Tehrani shows the process further comprising forming a diffusion barrier comprising Ta before the etch-stop layer such that the diffusion barrier is formed between the etch-stop layer and the substrate (see, e.g., col.6/ll.2). Tehrani further shows the etch stop layer comprising CrSi (see, e.g., col.6/ll.1), the substrate comprising a monolithic integrated circuit (see, e.g., col.2/ll.28-40), and that patterning the etch-stop layer comprises patterning the diffusion barrier (see, e.g., fig. 6).

### ***Claim Rejections - 35 USC § 103***

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Art Unit: 2814

18. Claims 3, 5-7, 10, 11, 15, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tehrani in view of Yue (US 5496759).

19. Regarding claims 3 and 15, Tehrani shows most aspects of the instant invention (see, e.g., paragraphs 5 and 10 above). He, however, fails to specify the thickness of the etch-stop layer. However, differences in thickness will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such thickness and/or concentration are critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the workable ranges by routine experimentation". *In re Aller*, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955).

Since the applicants have not established the criticality (see next paragraph) of the etch-stop thickness, and since the claimed thickness of 300 Å is in common use in similar devices in the art (see, e.g., Yue/col.2/II.42), it would have been obvious to one of ordinary skill in the art to use these values in the device of Tehrani.

#### CRITICALITY

20. The specification contains no disclosure of either the critical nature of the claimed thickness or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

21. Regarding claim 5, Tehrani shows the diffusion barrier comprises Ta (see, e.g., col.6/II.2).

22. Regarding claims 6 and 18, Yue shows the diffusion barrier is about 100 Å. See also the comments stated about in paragraphs 20 and 21 with respect to claims 3 and 15, which are considered repeated here.

Art Unit: 2814

23. Regarding claim 7, Tehrani shows the diffusion barrier comprises TaN (see, e.g., col.6/ll.2).

24. Regarding claim 10, Tehrani shows most aspects of the instant invention (see paragraph 8 above). He also shows that the step of selectively patterning the etch-stop layer includes forming a dielectric layer upon the etch-stop layer and removing portions of the dielectric layer and the etch-stop layer (see, e.g., figs. 5 and 6). He, however, fails to specify that the step of removing parts of the dielectric layer exposes portions of the etch-stop layer to be removed, and that the step of removing the etch-stop layer includes ion milling to remove the exposed portions of the etch-stop layer. Yue (see, e.g., col.3/ll.53-58), on the other hand, teaches that doing so would result in Tehrani having very well defined via openings with a very smooth opening edge.

It would have been obvious at the time of the invention to one of ordinary skill in the art to have the step of removing parts of Tehrani's dielectric layer to expose portions of the etch-stop layer and to subsequently ion mill the exposed portions of the layer, as suggested by Yue, because doing so would result in very well-defined via openings with very smooth edges.

25. Regarding claim 11, Tehrani (see, e.g., col.5/ll.32) teaches that the dielectric layer may be removed using reactive ion etching.

### ***Response to Arguments***

26. The applicants argue:

Tehrani does not teach "forming a conductive etch stop barrier layer covering the top surface of the magneto-resistive bit structure and the side walls of the bit" as claimed.

The examiner responds:



Tehrani shows these features of the claimed invention. See, e.g., col.5/ll.1-8, where Tehrani clearly describes that the cap layer completely seals the bit **41** to protect it against moisture, oxidation, and corrosive agents.

***Conclusion***

27. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

28. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

29. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 872-9306**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

30. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Marcos D. Pizarro-Crespo** at **(571) 272-1716** and

Art Unit: 2814


between the hours of 9:30 AM to 8:00 PM (Eastern Standard Time) Monday through Thursday or by e-mail via [Marcos.Pizarro@uspto.gov](mailto:Marcos.Pizarro@uspto.gov). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on (571) 272-1705.

31. Any inquiry of a general nature or relating to the status of this application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

32. The following list is the Examiner's field of search for the present Office Action:

| Field of Search                                      | Date      |
|--|-----------|
| U.S. Class / Subclass(es): 365/158,171-173; 438/3,48 | 4/11/2005 |
| Other Documentation:                                 |           |
| Electronic Database(s): EAST (USPAT, EPO, JPO)       | 4/11/2005 |

**Marcos D. Pizarro-Crespo**  
Patent Examiner  
Art Unit 2814, 571-272-1716  
MDP/mdp April 11, 2005

  
**Howard Weiss**  
Primary Examiner  
Art Unit 2814